NASA Procedural Requirements

COMPLIANCE IS MANDATORY

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Responsible Office: Office of Safety and Mission Assurance

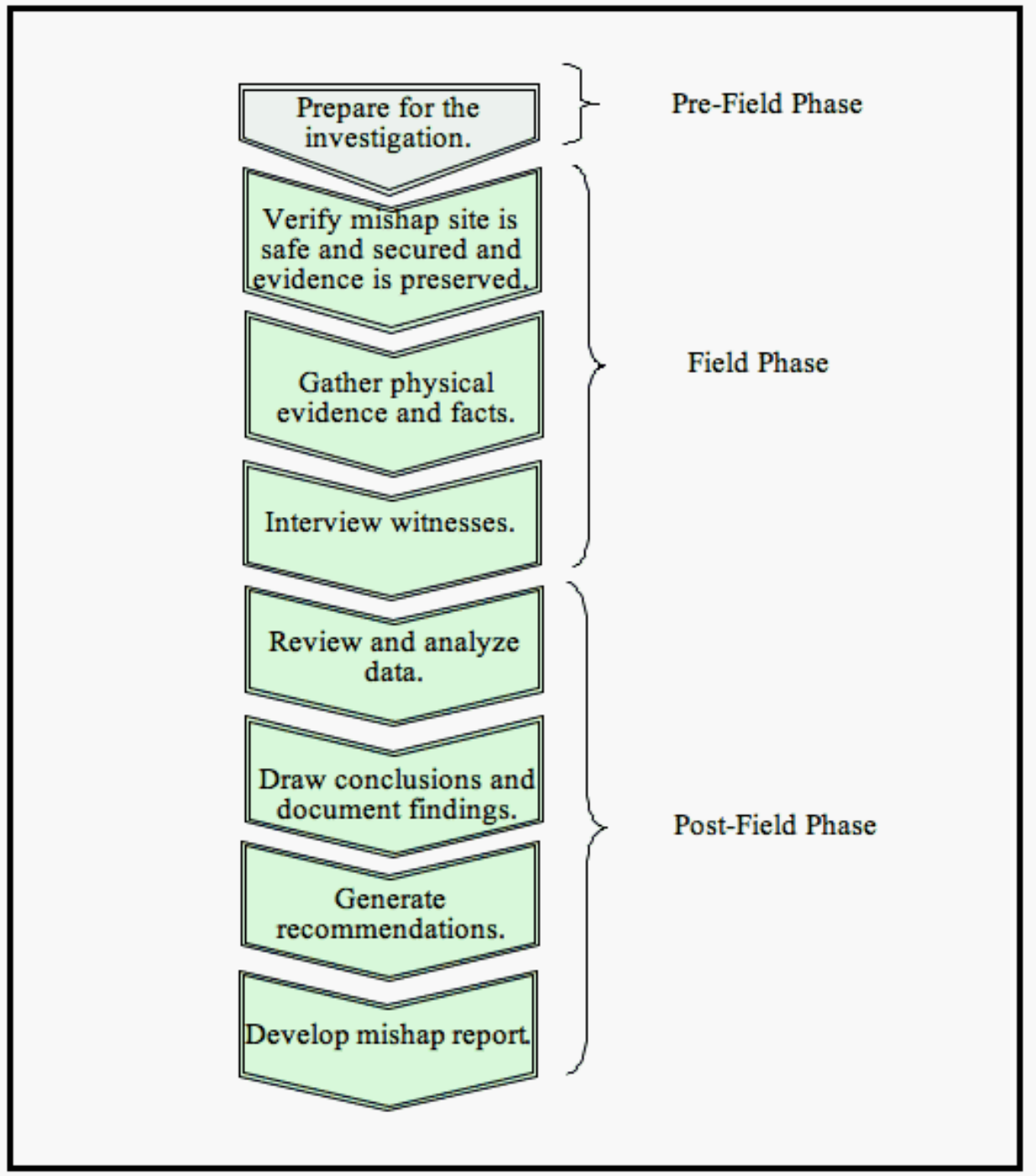
Chapter 5. Mishap Investigation Process

5.1 Overview of the Mishap Investigation Process

5.1.1 The investigating authority shall use a structured technique to collect and review all available data, construct a timeline of events, conduct witness interviews, reconstruct the mishap or close call, and analyze the mishap occurrence to determine what happened, when it happened, and why it happened (Requirement 31380).

5.1.2 Figure 7 illustrates the typical steps that the investigating authority shall perform during the mishap investigation (Requirement 31381).

Figure 7. Typical Steps in the Mishap Investigation



5.2 Prepare for the Investigation

The investigating authority shall perform the following activities prior to arrival at the mishap site or shortly thereafter:

a. Mishap investigation overview training (Requirement 31382).

(1) The Investigating Authority members and advisors shall take the NASA "Introduction to Mishap Investigation Training" upon their assignment to the investigation to familiarize themselves with NASA mishap investigation policies and procedures and root cause analysis (Requirement 31383). (Investigating authority members and advisors may opt out of the training if they have taken it within the last 12 months.)

b. Assessment of personnel resources (Requirement 31384). The chairperson may make a request to the appointing official to modify the investigating authority's membership to fill technical and/or analytical expertise gaps, provide management experience and knowledge, or eliminate members that have a conflict of interest.

(1) For Type A mishaps, Type B mishaps, high-visibility mishaps, and high-visibility close call investigation boards, the Chief/OSMA and Chief Engineer shall concur on membership changes prior to any MIB member additions or deletions (Requirement 31385).

c. Identification and selection of consultants as necessary (Requirement 31386).

d. Establishment of member duties, meeting times, and investigation schedules (Requirement 31387).

5.3 Verify that the Site is Safe and Secured and Ensure Evidence is Preserved/Impounded

5.3.1 Verify that the Mishap Site is Safe and Secured.

5.3.1.1 Upon arrival, the chairperson shall verify the site is safe and secured (Requirement 31390).

5.3.1.2 Neither the investigating authority nor the IRT has the authority to direct emergency response actions or activities to clean up a hazardous materials release (Requirement 31391).

(1) These actions shall be directed by the incident commander (Requirement 31392).

5.3.2 Ensure that Evidence is Preserved and Impounded.

5.3.2.1 The chairperson shall ensure that all the appropriate perishable evidence has been collected, photographed, documented, and/or impounded (Requirement 31394).

5.3.2.2 The chairperson shall ensure that all the necessary data, records, and equipment have been impounded and are being stored in a secure site (Requirement 31395).

5.3.2.3 The IRT, Center safety office personnel, emergency response personnel, and Center security office personnel shall provide the investigating authority with all evidence gathered at the scene; all data pertaining to the investigation, including impounded records; a status of impounded records/equipment; and a description of the actions taken (Requirement 31396).

5.3.2.4 When there is a mishap involving an injury or a fatality, the chairperson shall appoint a Federal employee to serve as an evidence custodian(s) who will implement the "chain of custody process" documented in the Program Mishap Preparedness and Contingency Plan to provide physical security over and controlled access to the injured/deceased personal effects and related sensitive material (Requirement).

5.4 Gather Physical Evidence and Facts

5.4.1 The investigating authority should evaluate three general sources of data (material, personnel, and records) during the investigation. The material area includes all parts, components, and support facilities directly or indirectly involved. The personnel area

includes all persons associated with the activities immediately surrounding the mishap, such as the flight crew, launch complex personnel, maintenance personnel, test personnel, operations personnel, range safety personnel, management and supervisory personnel, and witnesses and their associated training records, certification, e-mail, notes, and other records. The records data, regardless of format, include all records, telemetry, recordings, analyses, inspections, and historical data associated with the specific equipment, operations, and operating personnel.

5.4.2 The investigation should not be limited to data and records generated concurrently with, or as a result of, the mishap. It should also include historical, environmental, operational, psychological, and other factors bearing on the situation.

5.4.3 Lack of physical evidence. If there is no recoverable physical evidence available, the investigating authority shall use existing program and/or mission documentation, any collected mission data, and applicable analytical techniques to determine the probable proximate cause(s) and probable root cause(s) of the mishap (Requirement 31400).

5.5 Interview Witnesses

5.5.1 It is NASA's philosophy to interview witnesses rather than interrogate them. "Interview" connotes a cooperative meeting where the interviewer approaches the interviewee as an equal. The cooperation of the interviewee is sought; encouragement is given to tell the story freely without interruption or intimidation. An interview is usually conducted informally with a voluntary or cooperative answering of questions. However, the investigating authority may also conduct more formal interviews. Even in those cases, witnesses shall not be sworn in (Requirement 31402).

5.5.2 The investigating authority shall interview mishap witnesses with two basic objectives in mind:

a. To find out what the witness observed or did (Requirement 31404).

b. To find out the witness's opinion of potential cause(s) of the mishap (Requirement 31405).

5.5.3 The investigating authority conducting the witness interviews shall perform all steps as listed in paragraph 3.8 of this NPR (Requirement 31406).

5.6 Review and Analyze Data

5.6.1 The investigating authority shall determine the sequence of events and document them in a timeline (Requirement 31408).

5.6.2 The investigating authority shall create a fault tree, or perform an equivalent analysis, to identify all potential cause(s) and contributing factor(s) to the mishap and the relationships among them (Requirement 31409).

> *Note: A fault tree should be used by the MIB to demonstrate that all potential causes of the mishap have been evaluated. An event and causal factor tree should be used to represent all the events that did occur, and the relationship between the proximate, intermediate, and root causes.*

5.6.3 The investigating authority shall analyze all potential cause(s), including both

technical and human cause(s) (Requirement 31410).

5.7 Draw Conclusions and Document Findings

5.7.1 The investigating authority shall evaluate all information collected during the course of the investigation, including, but not limited to, physical evidence, witness statements and testimony, and analytical results from testing and analysis; draw conclusions concerning what happened and why it happened; and document these as investigation findings (Requirement 31412).

5.7.2 All findings shall be supported by facts (Requirement 31413).

5.8 Generate Recommendations

5.8.1 At a minimum, the investigating authority shall develop recommendations that address both the proximate cause(s) and the root cause(s) to prevent recurrence of the mishap or close call or similar mishaps and close calls (Requirement 31415).

5.8.2 The investigating authority shall verify that the recommendations are practical, feasible, and achievable (Requirement 31416).

5.8.3 The investigating authority shall prioritize the recommendations (Requirement 31417).

5.8.4 At any time during the investigation, the investigating authority may recommend to the appointing official that immediate corrective actions be taken to ensure the safety of ongoing operations internal or external to NASA.

5.8.5 Upon receipt of a safety critical recommendation, the appointing official shall evaluate the recommendation and communicate the recommendation to the responsible program, project, organization, or external body to initiate implementation of corrective measures (Requirement 31419).

5.9 When and How to Turn Over for Criminal Investigation

If it is reasonably suspected that a mishap resulted from criminal activity, the investigating authority shall halt the investigation; notify immediately the OIG and the Office of the General Counsel or the Office of the Chief Counsel, as appropriate; notify the appointing official; and wait for further direction (Requirement 31420). (The safety investigation should be completed regardless of the initiation of collateral investigations.)

5.10 Release the Mishap Site and Restore Site Operations

5.10.1 Only the investigating authority shall release the mishap site for post-investigation cleanup or other activities (Requirement 31422).

5.10.2 Only the investigating authority shall release impounded data, records, equipment, or facilities (Requirement 31423).

5.10.3 The investigating authority shall not release data and records unless copies of the documents are made and retained with mishap investigation records (Requirement 31424).

| TOC | ChangeHistory | Preface | Chapter1 | Chapter2 | Chapter3 | Chapter4 | Chapter5 | Chapter6 | Chapter7 | AppendixA | AppendixB | AppendixC | ALL |

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